PROJECT NUMBER: 6908
PROJECT TITLE: Smoke Condensate Studies
PROJECT LEADER: R. D. Kinser
PERIOD COVERED: July, 1987

I. TSNA PRECURSORS

A. **Objective**: To determine the precursors of MS TSNA.

B. **Results**: Significant levels of MS NAB were detected in the smoke from a low alkaloid burley filler with anabasine added at a target of 0.5%. A replicate addition of magnesium nitrate to "typical base web" confirmed the results reported last month: NNN and NAT increase dramatically, but no effect on MS NNK is observed. MS NO levels were found to be an order of magnitude greater in the smoke from the nitrate-treated tobacco.

Cyanuric acid was applied to burley tobacco as a possible NO scavenger. Addition of cyanuric acid at a target of 0.07% (moles filler cyanuric acid:moles MS NO = 1:3) resulted in no reduction in MS TSNA or NO deliveries.

Measurement by C. Morgan of dynamic and static burn rates for a control and a salt-treated cigarette demonstrated that both static and dynamic burn rates are reduced by the same amount for the treated cigarette. This indicates that the same amount of total filler was combusted dynamically for both control and treated cigarette, although puff counts were significantly greater for the treated cigarette.

C. **Plans**: Replicate the anabasine addition experiment. Prepare a plan for future salt effects studies. Utilize a non-tobacco smoking material to determine optimum levels for cyanuric acid additions.

D. **References**: Haut, S. A. Notebook No. 8468, p. 115.
Morgan, W. R. Notebook No. 8506, p. 96.

II. TSNA REMOVAL STUDIES

A. **Objective**: To explore the possibility of extracting TSNA from stored tobacco using an extracting fluid compatible with current processing.

B. **Results**: DBC burley was extracted in the apparatus fabricated by project personnel and described previously (Acc. No. 87-055, Project No. 6902 Monthly Progress Report). Solvents used were water, 95% ethanol, and 48.5% ethanol. Experiments were conducted at 1°C and 50°C. Differences in terms of TSNA removal were not as pronounced at 1°C, but at 50°C, the most selective solvent was 95% ethanol. Weight losses were only 14.5% and TSNA losses greater than 95%, compared to weight losses of ~25% and TSNA reductions of 75-80% for the other solvents.

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C. **Plans**: Evaluate absolute ethanol, 2-propanol, 2-methyl-2-propanol, and hexane as solvents for TSNA removal.

D. **References**: Warfield, A. H. Notebook No. 8196, p. 170.
Hansen, K. R. Notebook No. 8532, p. 1.

III. ALTERNATIVES TO CARBON TRAPPING OF NICOTINE IN SCFE OF TOBACCO

A. **Objective**: To determine the efficacy of other nicotine trapping systems at the removal of TSNA from the process stream.

B. **Results**: Various burley stem samples were evaluated for TSNA content after being utilized as nicotine adsorbers in the R&D supercritical fluid extraction system. Best results in terms of TSNA levels were obtained with the extensively washed stems from the BL plant.

C. **Plans**: As requested, evaluate other nicotine adsorbers in terms of TSNA behavior.

D. **References**: Hansen, K. R. Notebook No. 8532, p. 1.

IV. CARBONYL CONTENT OF SMOKE FROM A MODEL CIGARETTE OF LOW BIOLOGICAL ACTIVITY

A. **Objective**: To determine the chemical components responsible for the poor subjectives of smoke from a model cigarette of low biological activity (washed, shredded bright stems (WSBS)), and develop methods to decrease the levels of these components.

B. **Results**:Machine-made full flavor blend (FFB) cigarettes with 3 mg of THAM incorporated into a cellulose acetate (CA) filter exhibited a 68% reduction in formaldehyde delivered into mainstream, relative to a control FFB cigarette with normal CA filter.

C. **Plans**: Obtain subjective evaluation on the THAM-filtered FFB cigarettes and WSBS cigarettes with THAM on charcoal or THAM crystals in a plug/space/plug filter configuration.

D. **References**: Levins, R. J. Notebook No. 8413, p. 173.

V. SUPPORT FUNCTION: CONDENSATE PREPARATION

A. **Objective**: To fabricate cigarettes, perform smokings, and prepare condensate as needed for biological and chemical analysis.

B. **Results**: Nine different cigarette fillers were prepared by spraying burley CEL on bright base web. The burley CEL was used as is, modified by addition of glucose or fructose, or hydrolyzed and subjected to ion exchange, pH adjustment, and glucose

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addition. Thirty smokings of 10 cigarette codes were performed to yield TPM or impaction trapped material for further analysis.

D. **References**: Hellams, R. D. Notebook No. 8480, p. 146.
Williams, D. L. Notebook No. 8530, p. 12.

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